

The listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

1. (Currently Amended) A process for preparing tetrahydropterin or a tetrahydropterin compound comprising hydrogenating pterin or a pterin compound with hydrogen in a polar reaction medium in the presence of a hydrogenation catalyst that is a metal complex that is soluble in the reaction medium, wherein the catalyst has (i) a ligand comprising containing a triarylphosphine, (ii) a ligand comprising containing a tetramethylene phenylphosphine or (iii) a ligand containing a pentamethylene phenylphosphine, or (iv) a bidentate ligand with a tertiary amine group and a phosphine group or with two triarylphosphine groups as complexing groups, wherein the bidentate ligands form together with a metal atom a five- to ten membered ring.

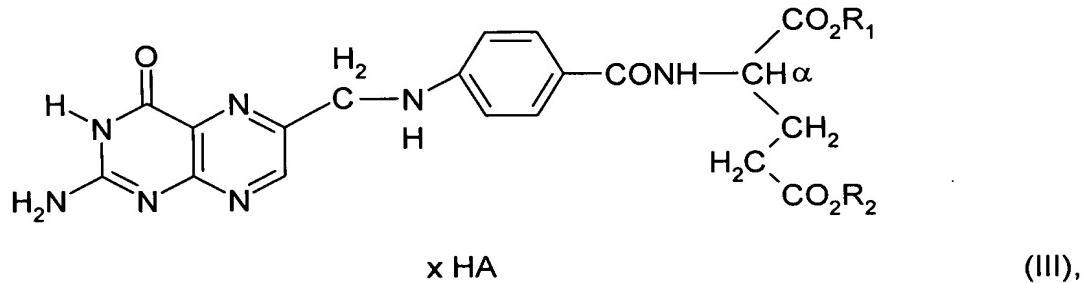
2. (Previously Presented) A process according to claim 1, wherein the polar reaction medium is an aqueous or alcoholic reaction medium.

3. (Previously Presented) A process according to claim 1, wherein the pterin compound is folic acid, a folic acid salt, a folic acid ester, a folic acid ester salt or a dihydro form thereof, with the proviso that in the event of using folic acid, a carboxylic acid thereof or a dihydro form thereof, the reaction medium is aqueous, and in the event of using a folic acid ester, a folic acid ester salt or a dihydro form thereof, the reaction medium is an alcohol.

4. (Previously Presented) A process according to claim 1, wherein the metal complex contains a chiral ligand.

5. (Previously Presented) A process according to claim 3, wherein the metal complex contains a chiral ligand.

6. (Currently Amended) A process according to claim 5, wherein the folic acid ester salt is of formula III and is in the form of a single enantiomer or a mixture of enantiomers of formula III,



in which

one of R<sub>1</sub> or R<sub>2</sub> is H, and the other one of R<sub>1</sub> or R<sub>2</sub> is a monovalent hydrocarbon radical or a hydrocarbon radical attached via a carbon atom that contains in which one or more carbon atoms are each independently replaced by oxygen, sulfur, or NH, -N=, or -N(C<sub>1</sub>-C<sub>4</sub> Alkyl)- nitrogen atoms, or

both R<sub>1</sub> and R<sub>2</sub> independently of one another represent a monovalent hydrocarbon radical or a hydrocarbon radical attached via a carbon atom that contains in which one or more carbon atoms

are each independently replaced by oxygen, sulfur, or NH, -N=, or -N(C<sub>1</sub>-C<sub>4</sub> Alkyl)- nitrogen atoms,

HA stands for a monobasic to tribasic inorganic or organic acid, and

x denotes an integer from 1 to 6 or a fractional number between 0 and 6.

7. (Previously Presented) A process according to claim 6, wherein HA is unsubstituted or substituted phenylsulphonic acid.

8. (Previously Presented) A process according to claim 1, wherein said process is carried out at a hydrogen pressure of 1 to 500 bars.

9. (Previously Presented) A process according to claim 1, wherein said process is carried out at a temperature is 0 to 150<sup>0</sup> C.

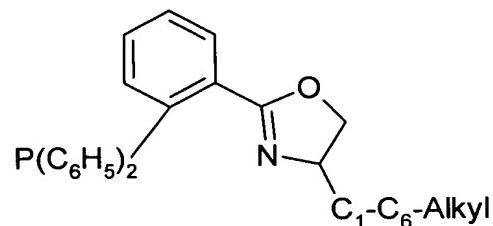
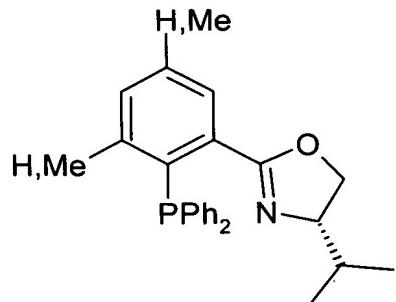
10. (Previously Presented) A process according to claim 1, wherein the molar ratio of pterin or pterin compound to catalyst is 10 to 100,000.

11. (Previously Presented) A process according to claim 1, wherein the reaction medium is water or water in admixture with an organic solvent.

12. (Previously Presented) A process according to claim 2, wherein the alcoholic reaction medium is an alcohol, or an alcohol in admixture with an organic solvent.

13. (Previously Presented) A process according to claim 1, wherein the metal complex contains a d-8 metal.

14. (Previously Presented) A process for preparing tetrahydropterin or a tetrahydropterin compound comprising hydrogenating pterin or a pterin compound with hydrogen in a polar reaction medium in the presence of a hydrogenation catalyst that is a metal complex that is soluble in the reaction medium, wherein the catalyst has a ligand that is an achiral or chiral ditertiary diphosphine, or a compound of the following formulae



15. (Previously Presented) A process according to claim 14, wherein the reaction medium is an alcoholic reaction medium, and wherein in the ditertiary diphosphines the phosphine groups are attached (a) to various carbon atoms of a hydrocarbon chain having 2 to 4 carbon atoms, or (b) directly via a bridging group -CR<sub>a</sub>R<sub>b</sub>- in the ortho positions of a cyclopentadienyl ring or to a cyclopentadienyl ring of a ferrocenyl, wherein R<sub>a</sub> and R<sub>b</sub> are the same or different and stand for H, C<sub>1</sub>-C<sub>8</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> fluoroalkyl, C<sub>5</sub>-C<sub>6</sub> cycloalkyl, phenyl, benzyl, or phenyl or benzyl substituted with 1 to 3 C<sub>1</sub>-C<sub>4</sub> alkyl or C<sub>1</sub>-C<sub>4</sub> alkoxy.

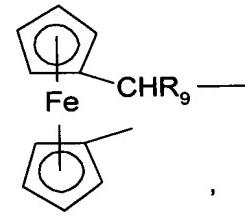
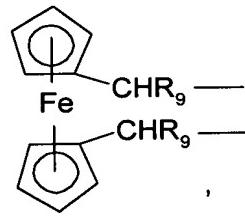
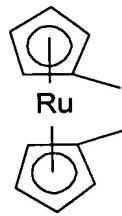
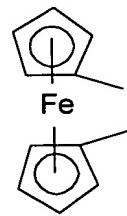
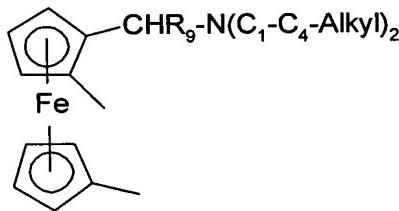
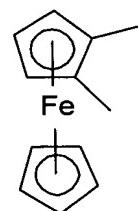
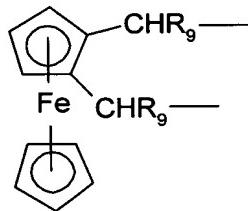
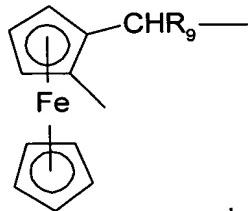
16. (Previously Presented) A process according to claim 14, wherein the reaction medium is an alcoholic reaction medium, and the diphosphine of formula IV,



in which

$R_4$ ,  $R_5$ ,  $R_7$  and  $R_8$  independently of one another represent a hydrocarbon radical with 1 to 20 carbon atoms, which is unsubstituted or substituted with halogen,  $C_1$ - $C_6$  alkyl,  $C_1$ - $C_6$  haloalkyl,  $C_1$ - $C_6$  alkoxy,  $C_1$ - $C_6$  haloalkoxy,  $(C_6H_5)_3Si$ ,  $(C_1$ - $C_{12}$  alkyl) $_3Si$ ,  $-NH_2$ ,  $-NH(C_1$ . $C_{12}$  alkyl),  $-NH(phenyl)$ ,  $-NH(benzyl)$ ,  $-N(C_1$ . $C_{12}$  alkyl) $_2$ ,  $-N(phenyl)_2$ ,  $-N(benzyl)_2$ , morpholinyl, piperidinyl, pyrrolidinyl, piperazinyl, -ammonium- $X_3^-$ ,  $-SO_3M_1$ ,  $-CO_2M_1$ ,  $-PO_3M_1$ , or  $-CO_2-C_1$ - $C_6$  alkyl, in which  $M_1$  represents an alkali metal or hydrogen and  $X_3^-$  is the anion of a monobasic acid; or  $R_4$  and  $R_5$ , and/or  $R_7$  and  $R_8$  together denote tetramethylene, pentamethylene, or 3-oxa-pentane-1,5-diyl, which is unsubstituted or substituted with halogen,  $C_1$ - $C_6$  alkyl or  $C_1$ - $C_6$  alkoxy; and  $R_6$  is  $C_2$ - $C_4$  alkylene, which is unsubstituted or substituted with  $C_1$ - $C_6$  alkyl,  $C_1$ - $C_6$  alkoxy,  $C_5$  or  $C_6$  cycloalkyl, phenyl, napthyl, or benzyl; 1,2 or 1,3-cycloalkylene, 1,2- or 1,3-cycloalkylenylene, 1,2- or 1,3-bicycloalkylene or 1,2- or 1,3-bicycloalkenylene with 4 to 10 carbon atoms, which is unsubstituted or substituted with  $C_1$ - $C_6$  alkyl, phenyl, or benzyl; 1,2- or 1,3-cycloalkylene, 1,2- or 1,3-cycloalkylene, 1,2- or 1,3-bicycloalkylene or 1,2- or 1,3-bicycloalkylene with 4 to 10 carbon atoms, which is unsubstituted or substituted with  $C_1$ - $C_6$  alkyl, phenyl, or benzyl, at whose 1 and/or 2 positions or at whose 3-position methylene or  $C_2$ - $C_4$  alkylidene is attached; 1,4-butylene substituted in the 2,3 positions with  $R_9R_{10}C(O^-)_2$ , and which in the 1 and/or 4 positions is unsubstituted or substituted with  $C_1$ - $C_6$  alkyl, phenyl, or benzyl, and

where R<sub>9</sub> and R<sub>10</sub> independently of one another represent hydrogen, C<sub>1</sub>-C<sub>6</sub> alkyl, phenyl or benzyl; 3,4- or 2,4-pyrrolidinylene or methylene-4-pyrrolidine-4-yl whose nitrogen atom is substituted with hydrogen, C<sub>1</sub>-C<sub>12</sub> alkyl, phenyl, benzyl, C<sub>1</sub>-C<sub>12</sub> alkoxy carbonyl, C<sub>1</sub>-C<sub>8</sub> acyl, C<sub>1</sub>-C<sub>12</sub> alkylaminocarbonyl; or denotes 1,2-phenylene, 2-benzylene, 1,2-xylylene, 1,8-naphthylene, 2,2'-dinaphthylene or 2,2'-diphenylene, which is unsubstituted or substituted with halogen, -OH, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>6</sub> alkoxy, phenyl, benzyl, phenoxy or benzyloxy; or R<sub>6</sub> stands for a radical of the formulas



in which R<sub>9</sub> denotes hydrogen, C<sub>1</sub>-C<sub>8</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> fluoroalkyl, unsubstituted phenyl or phenyl substituted with 1 to 3 F, Cl, Br, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> alkoxy or fluoromethyl.

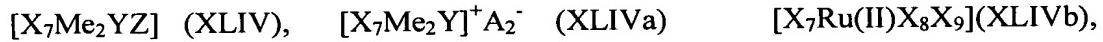
17. (Previously Presented) A process according to claim 14, wherein the reaction medium is an aqueous reaction medium, and the diphosphine contains one or more water-solubilising polar substituents, which are attached either direct or via a bridging group to substituents of the phosphine group.

18. (Previously Presented) A process according to claim 14, wherein the reaction medium is an aqueous reaction medium, and the diphosphine is of formula XLIII,



in which M<sub>1</sub> stands for H, an alkali metal cation or an ammonium cation, R<sub>42</sub> denotes C<sub>1</sub>-C<sub>4</sub> alkyl or H, and R<sub>41</sub> is a monovalent radical of a chiral ditertiary diphosphine, with the CO group being attached direct to a carbon or nitrogen atom of the diphosphine skeleton, or to an oxygen or nitrogen atom or to a carbon atom of a bridging group of the diphosphine skeleton.

19. (Previously Presented) A process for preparing tetrahydropterin or a tetrahydropterin compound comprising hydrogenating pterin or a pterin compound with hydrogen in a polar reaction medium in the presence of a hydrogenation catalyst that is a metal complex that is soluble in the reaction medium of formula XLIV, XLIVa or XLIVb,



in which

Y stands for monoolefin ligands or a diene ligand;

X<sub>7</sub> represents an achiral or chiral ditertiary diphosphine that forms a 5 to 7 membered ring with the metal atom Me<sub>2</sub> or Ru;

Me<sub>2</sub> denotes Ir(I) or Rh(I);

Z represents -Cl, -Br, or -I; and

A<sub>2</sub> is an anion of an oxy-acid or complex acid;

X<sub>8</sub> and X<sub>9</sub> are the same or different and have the meaning of Z or A<sub>2</sub>, or X<sub>8</sub> and

X<sub>9</sub> stand for allyl or 2-methylallyl, or X<sub>8</sub> has the meaning of Z or A and X<sub>9</sub> stands for hydride.

20-28. (Cancelled)

29. (Previously Presented) A process for preparing tetrahydropterin or a tetrahydropterin compound, comprising hydrogenating pterin or a pterin compound with hydrogen in alcohol or in alcohol in admixture with an organic solvent in the presence of a hydrogenation catalyst that is a metal complex that is soluble in the reaction medium.

30. (Previously Presented) A process for preparing tetrahydropterin or a tetrahydropterin compound, comprising hydrogenating pterin or a pterin compound with hydrogen in a polar reaction medium in the presence of a hydrogenation catalyst that is a metal complex that is and contains an achiral or chiral ditertiary diphosphine.

31. (Previously Presented) A process for preparing tetrahydropterin or a tetrahydropterin compound, comprising hydrogenating pterin or a pterin compound with

hydrogen in an alcoholic reaction medium in the presence of a hydrogenation catalyst—that is a metal complex that is soluble in the reaction medium and contains an achiral or chiral ditertiary diphosphine that is attached (a) to various carbon atoms of a hydrocarbon chain having 2 to 4 carbon atoms, or (b) directly via a bridging group  $-\text{CR}_a\text{R}_b-$  in the ortho positions of a cyclopentadienyl ring or to a cyclopentadienyl ring of a ferrocenyl, wherein  $\text{R}_a$  and  $\text{R}_b$  are the same or different and stand for H, C<sub>1</sub>-C<sub>8</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> fluoroalkyl, C<sub>5</sub>-C<sub>6</sub> cycloalkyl, phenyl, benzyl, or phenyl or benzyl substituted with 1 to 3 C<sub>1</sub>-C<sub>4</sub> alkyl or C<sub>1</sub>-C<sub>4</sub> alkoxy.

32. (Cancelled)

33. (Previously Presented) A process according to claim 3, wherein the hydrogenation is carried out at elevated pressure.

34. (Previously Presented) A process according to claim 1, wherein the metal complex contains iridium, rhodium or ruthenium.

35 (Previously Presented) A process according to claim 14, wherein the reaction medium is an alcoholic reaction medium, and wherein in the ditertiary diphosphines the phosphine groups are attached (a) to various carbon atoms of a hydrocarbon chain having 2 to 4 carbon atoms, or (b) directly via a bridging group  $-\text{CR}_a\text{R}_b-$  in the ortho positions of a cyclopentadienyl ring or to a cyclopentadienyl ring of a ferrocenyl, wherein  $\text{R}_a$  and  $\text{R}_b$  are the same or different and stand for H, C<sub>1</sub>-C<sub>8</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> fluoroalkyl, C<sub>5</sub>-C<sub>6</sub> cycloalkyl, benzyl, or phenyl.

36. (Previously Presented) A process according to claim 18, wherein R<sub>42</sub> denotes H.

37. (Previously Presented) A process according to claim 31, wherein R<sub>a</sub> and R<sub>b</sub> are the same or different and stand for H, C<sub>1</sub>-C<sub>8</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> fluoroalkyl, C<sub>5</sub>-C<sub>6</sub> cycloalkyl, benzyl, or phenyl.

38. (Previously Presented) A process according to claim 14, wherein the pterin compound is folic acid, a folic acid salt, a folic acid ester, a folic acid ester salt or a dihydro form thereof, with the proviso that in the event of using folic acid, a carboxylic acid thereof or a dihydro form thereof, the reaction medium is aqueous, and in the event of using a folic acid ester, a folic acid ester salt or a dihydro form thereof, the reaction medium is an alcohol.

39. (Previously Presented) A process according to claim 19, wherein the pterin compound is folic acid, a folic acid salt, a folic acid ester, a folic acid ester salt or a dihydro form thereof, with the proviso that in the event of using folic acid, a carboxylic acid thereof or a dihydro form thereof, the reaction medium is aqueous, and in the event of using a folic acid ester, a folic acid ester salt or a dihydro form thereof, the reaction medium is an alcohol.

40. (Previously Presented) A process according to claim 29, wherein the pterin compound is folic acid, a folic acid salt, a folic acid ester, a folic acid ester salt or a dihydro form thereof, with the proviso that in the event of using folic acid, a carboxylic acid thereof or a

dihydro form thereof, the reaction medium is aqueous, and in the event of using a folic acid ester, a folic acid ester salt or a dihydro form thereof, the reaction medium is an alcohol.

41. (Previously Presented) A process according to claim 30, wherein the pterin compound is folic acid, a folic acid salt, a folic acid ester, a folic acid ester salt or a dihydro form thereof, with the proviso that in the event of using folic acid, a carboxylic acid thereof or a dihydro form thereof, the reaction medium is aqueous, and in the event of using a folic acid ester, a folic acid ester salt or a dihydro form thereof, the reaction medium is an alcohol.

42. (Previously Presented) A process according to claim 31, wherein the pterin compound is folic acid, a folic acid salt, a folic acid ester, a folic acid ester salt or a dihydro form thereof, with the proviso that in the event of using folic acid, a carboxylic acid thereof or a dihydro form thereof, the reaction medium is aqueous, and in the event of using a folic acid ester, a folic acid ester salt or a dihydro form thereof, the reaction medium is an alcohol.

43. (Currently Amended) A process according to claim 6, wherein R<sub>1</sub> and/or R<sub>2</sub> are, each independently, an aliphatic radical with 1-20 carbon atoms, a cycloaliphatic radical with 3-8 carbon atoms, a cycloaliphatic-aliphatic radical with 3-8 cyclic carbon atoms and 1 to 6 carbon atoms in the aliphatic part of the radical, an aromatic hydrocarbon radical with 6-14 carbon atoms, an aromatic-aliphatic radical with 7-15 carbon atoms, a heteroalkyl an alkyl radical with 2-16 carbon atoms in which one or more carbon atoms are each independently replaced by oxygen, sulfur, NH, -N=, or -N(C<sub>1</sub>-C<sub>4</sub> Alkyl)-, a heterocycloaliphatic radical with 3-8 ring links, a heterocycloaliphatic-aliphatic radical with 3-8 ring links and 1 to 6 carbon atoms in the

aliphatic part of the radical, a heteroaromatic radical with 4 to 13 carbon atoms, a heteroaromatic-aliphatic radical with 4 to 13 cyclic carbon atoms and 1 to 6 carbon atoms in the aliphatic part of the radical, wherein the hetero part of each group means that the radical contains one or more oxygen, sulfur or nitrogen atoms.

44. (Previously Presented) A process according to claim 17, wherein the bridging group is of formula

-X<sub>5</sub>-R<sub>41</sub>-

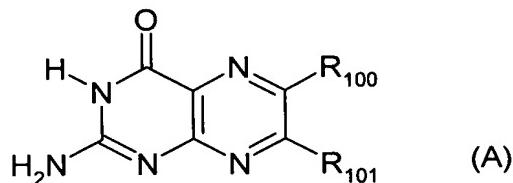
wherein

X<sub>5</sub> is a direct bond, O, NH, Si(CH<sub>3</sub>)<sub>2</sub>, N(C<sub>1</sub>-C<sub>4</sub>-alkyl), NH-CO, N(C<sub>1</sub>-C<sub>4</sub>-alkyl)CO, CO-NH, CON(C<sub>1</sub>-C<sub>4</sub>-alkyl), NH-CO-O, N(C<sub>1</sub>-C<sub>4</sub>-alkyl)CO-O, O-CO-NH, O-CON(C<sub>1</sub>-C<sub>4</sub>-alkyl), NH-CO-NH, N(C<sub>1</sub>-C<sub>4</sub>-alkyl)CO-NH or N(C<sub>1</sub>-C<sub>4</sub>-alkyl)CO-N(C<sub>1</sub>-C<sub>4</sub>-alkyl), and

R<sub>41</sub> is a divalent hydrocarbon radical with 1 to 40 carbon atoms.

45. (Previously Presented) A process according to claim 1, wherein the pterin compound is a pterin that is substituted in the 6- and/or 7- positions.

46. (Currently Amended) A process according to claim 1, wherein the pterin compound is of formula (A)



in which

R<sub>101</sub> is H or independently has the meaning of R<sub>100</sub>,

R<sub>100</sub> is an organic radical attached via a C, O or N atom and having 1 to 50 carbon atoms,

~~which is not interrupted or which is interrupted by one or more of O, NH, N(C<sub>1</sub>-C<sub>4</sub>-alkyl),~~

~~alkyl~~, ~~C(O)~~, ~~C(O)O~~, ~~OC(O)~~, ~~OC(O)O~~, ~~C(O)NH~~, ~~NHC(O)~~, ~~NHC(O)O~~, ~~OC(O)NH~~, ~~NHC(O)NH~~, ~~C(O)N(C<sub>1</sub>-C<sub>4</sub>-alkyl)~~, ~~N(C<sub>1</sub>-C<sub>4</sub>-alkyl)C(O)~~, ~~N(C<sub>1</sub>-C<sub>4</sub>-alkyl)C(O)O~~, ~~OC(O)N(C<sub>1</sub>-C<sub>4</sub>-alkyl)~~, ~~N(C<sub>1</sub>-C<sub>4</sub>-alkyl)C(O)N(C<sub>1</sub>-C<sub>4</sub>-alkyl)~~, and which is unsubstituted or is substituted with F, Cl, Br, -CN, -OCN, -NCO, -OH, -NH<sub>2</sub>, -NHC<sub>1</sub>-C<sub>4</sub>-alkyl, ~~N(C<sub>1</sub>-C<sub>4</sub>-alkyl)<sub>2</sub>~~, C<sub>1</sub>-C<sub>4</sub>-alkyl, C<sub>1</sub>-C<sub>4</sub>-haloalkyl, C<sub>1</sub>-C<sub>4</sub>-hydroxyalkyl, C<sub>1</sub>-C<sub>4</sub>-alkoxy, C<sub>1</sub>-C<sub>4</sub>-haloalkoxy, -C(O)OH, -C(O)OM<sub>100</sub>, -C(O)OC<sub>1</sub>-C<sub>4</sub>-alkyl, -C(O)NH<sub>2</sub>, -C(O)NHC<sub>1</sub>-C<sub>4</sub>-alkyl, -C(O)N(C<sub>1</sub>-C<sub>4</sub>-alkyl)<sub>2</sub>, R<sub>102</sub>-C(O)O, R<sub>102</sub>-OC(O)O, R<sub>102</sub>-C(O)NH, R<sub>102</sub>-C(O)N(C<sub>1</sub>-C<sub>4</sub>-alkyl), R<sub>102</sub>-NHC(O)NH, R<sub>103</sub>C(O)- or -CH(O),

M<sub>100</sub> is Li, K, Na, NH<sub>4</sub><sup>+</sup>, or ammonium with 1 to 16 carbon atoms,

R<sub>102</sub> is C<sub>1</sub>-C<sub>8</sub>-alkyl, C<sub>5</sub>- or C<sub>6</sub>-cycloalkyl, phenyl or benzyl, and

R<sub>103</sub> is C<sub>1</sub>-C<sub>4</sub>-alkyl, phenyl or benzyl.

47. (New) A process according to claim 46, wherein R<sub>100</sub> is not interrupted or is interrupted by one or more of -O-, -NH-, -N(C<sub>1</sub>-C<sub>4</sub>-alkyl)-, -C(O)-, -C(O)O-, -OC(O)-, -OC(O)O-, -C(O)NH-, -NHC(O)-, -NHC(O)O-, -OC(O)NH-, -NHC(O)NH-, -C(O)N(C<sub>1</sub>-C<sub>4</sub>-alkyl)-, -N(C<sub>1</sub>-C<sub>4</sub>-alkyl)C(O)-, -N(C<sub>1</sub>-C<sub>4</sub>-alkyl)C(O)O-, -OC(O)N(C<sub>1</sub>-C<sub>4</sub>-alkyl)-, -N(C<sub>1</sub>-C<sub>4</sub>-alkyl)C(O)N(C<sub>1</sub>-C<sub>4</sub>-alkyl)-, and which is unsubstituted or is substituted with F, Cl, Br, -CN, -OCN, -NCO, -OH, -NH<sub>2</sub>, -NHC<sub>1</sub>-C<sub>4</sub>-alkyl, -N(C<sub>1</sub>-C<sub>4</sub>-alkyl)<sub>2</sub>, C<sub>1</sub>-C<sub>4</sub>-alkyl, C<sub>1</sub>-C<sub>4</sub>-haloalkyl, C<sub>1</sub>-C<sub>4</sub>-hydroxyalkyl, C<sub>1</sub>-C<sub>4</sub>-alkoxy, C<sub>1</sub>-C<sub>4</sub>-haloalkoxy, -C(O)OH, -C(O)OM<sub>100</sub>, -C(O)OC<sub>1</sub>-C<sub>4</sub>-alkyl, -C(O)NH<sub>2</sub>, -C(O)NHC<sub>1</sub>-C<sub>4</sub>-alkyl, -C(O)N(C<sub>1</sub>-C<sub>4</sub>-alkyl)<sub>2</sub>, R<sub>102</sub>-C(O)O-, R<sub>102</sub>-OC(O)O-, R<sub>102</sub>-C(O)NH-, R<sub>102</sub>-C(O)N(C<sub>1</sub>-C<sub>4</sub>-alkyl)-, R<sub>102</sub>-NHC(O)NH-, R<sub>103</sub>C(O)- or -CH(O).